

WESTERN PINE BEETLE SURVEY

HAPPY CAMP-LAVA BED AREA

MODOC NATIONAL FOREST

CALIFORNIA

December, 1929

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Preface

During the fall of this year (1929) from September 16 to October 15 the eighth annual survey of the Modoc Happy Camp-Lava Bed Area was made. As in the past, it was a cooperative undertaking between the Forest Service, the Pickering Lumber Company and the Bureau of Entomology. The supervision of the work was directly under the Bureau, but this year the cooperators not only paid the field expenses but furnished men to assist in the work. The Forest Service assigned to the survey Mr. Alvin Parker, lumberman in charge of the Badger Sale, and the Pickering Lumber Company turned over Messrs. Otis and Ernest Buck, both experienced beetle cruisers. The Bureau of Entomology supplied the field equipment, transportation for the camp equipment, and the services of Mr. I.J. Hastings and the writer.

The total cost of the survey was approximately as follows:

Forest Service

Salaries - - -	\$150.00
Expenses - - -	118.04
Total - - -	\$268.04

Pickering Lumber Co.

Salaries - - -	\$390.00
Mileage - - -	60.00
Total - - -	450.00

Bureau of Entomology

Salaries - - -	456.00
	456.00

TOTAL - - - - - \$1174.04

The pine beetle surveys which were started on the Happy Camp-Lava Bed Area in 1921 serve three purposes, viz.: (1) keeping the area under close observation, so that any flare-up of insect activity can be quickly noted; (2) providing information to the owners of the amount of current losses and the desirability and location of any control work; and (3) securing investigative data on the trend of beetle epidemics which should be of considerable value in predicting future outbreaks.

The survey is conducted under the supervision of the Bureau of Entomology, and the data are obtained for the most part by recruiting permanent sample plots strategically located throughout the area. In addition, sample strips are run through portions of the area not covered by plots, or to supplement the plot data.

From September 15 to October 15, when the survey was made, it is found that from 70 to 90 per cent of the trees of the current year's loss can be spotted. The estimates are therefore increased accordingly. In spite of this handicap, the estimates which have been made in the past and based upon fall cruising have been fully as accurate as those made in the spring when a higher percentage of the trees are visible. Under any condition, the estimate is largely a matter of the judgment of the estimator based upon his experience. The small amount of quantitative data secured only serves to aid him in arriving at his conclusions and final estimate.

Resumé of Past Infestations

Former survey reports have covered very adequately the general trend of the infestation during the period 1921 to 1928. Old evidence indicates that the area had an epidemic outbreak of beetles during the period of 1917-18, as did the area farther north. The surveys showed that a low point in 1923 was reached. Then with the dry year of 1924 and the succeeding years of subnormal precipitation the epidemic started up again and increased rapidly with each succeeding season. The peak was reached in 1927 and the summer of 1928, and then with the favorable growth year of 1928 a very sudden drop occurred in the fall of 1928 and continued through the following year.

This trend in volume of timber killed and percentage of stand is as follows:

<u>Year</u>	<u>Per Cent of Stand Killed</u>	<u>Volume Killed (M.B.M.)</u>
1921	.72	40,030
1922	.58	32,485
1923	.30	16,610
1924	.59	33,140
1925	1.12	62,680
1926	2.04	115,200
1927	3.26	183,900
1928	2.33	134,000
1929	.97	53,290
		671,335

The Present Infestation

The peak of the recent epidemic occurred in 1927 and the summer of 1928. The winter loss of 1928 dropped very markedly and this decline continued in 1929. On the check sections, the average 1928 infestation was about 60% of the 1927, and the 1929 infestation only 53% of the 1928.

The reduction varied considerably in different parts of the area, and in general, the more highly epidemic the infestation the greater the drop. Units with a very low loss changed but little.

The Badger Unit showed the greatest reduction. On the treated area a 90% decline was secured and on the remainder of the unit an 80% drop was recorded. Perhaps a part of this decline in adjacent units was due to the disturbing influence of the control work. The next greatest reduction occurred on the Happy Camp Unit, in the heavy center near Mud Springs. Here the check section showed a 73% reduction. The Glass Mountain Unit showed only a 60% reduction.

The Lava Unit and Pit River Units showed the slightest change, with reductions of 30% and 15% respectively.

Even though the epidemic has been severely broken, the infestation has not reached a normal status on all parts of the area. On the Glass Mountain Unit, for instance, the losses still continue to run over 3% of the stand along the northern edge and from 1% to 3% over quite a large part of the area. Through the central part of the Happy Camp Unit the losses for 1929 are also somewhat over 1% of the stand.

The break in the epidemic was undoubtedly due in part to the better tree growth conditions which prevailed in 1928. The removal of a high percentage of susceptible trees has in the past been considered as an important cause of cessation of beetle activity, but this theory seems to have failed in the present case, since the Glass Mountain area with 50% of the timber killed still remains actively epidemic.

The year 1929 has been another year of poor tree growth, and the fall has been one of unprecedented drought. These conditions should cause further weakening of trees and the bringing of many more trees into beetle-susceptible condition. Therefore the outlook for 1930 is not bright, as it is anticipated that 1930 will bring with it an increase in pine beetle activity, just as subnormal weather brought an increase in 1925. Thus the control work which is being done this fall and winter is being done at a most opportune time. There is already an indication of this increase in that the winter loss of 1929 slightly exceeds the summer loss.

The conditions on the different units are summarized in the following pages.

Glass Mountain Unit

Strange as it may seem, beetles are still killing a high percentage of the timber which has survived the previous epidemics along the northern edge of the unit. Fully 50% of portions of this stand have been killed during the past five years. The surviving stand is sparse and scattered, with a higher percentage of younger trees than in the older stand. And still the beetles continue their activity, extending

their depredations to smaller and thriftier trees. In this stand the trees were not suffering from competition, as they were widely spaced to start with, so thinning the stand has had no effect in releasing trees from competition. This area is evidently suffering severely from drought and until soil moisture conditions are improved we can expect little change in rate of tree mortality.

There is a very abrupt improvement in conditions as one moves back onto the upper bench, even though there is no apparent change in soil or site conditions. From a highly epidemic status, the infestation drops off to normal. Beetle loss at the upper elevation is far below growth replacement.

In the eastern and southern parts of the unit there is a belt where the infestation exceeds 1% of the stand. This appears to be an extension of the epidemic conditions found to the north. With a change for the worse in climatic conditions this infestation may prove troublesome, but for the present it is no more aggressive than that in the rest of the area.

For the last two seasons the loss on this unit has been as follows:

Glass Mountain Unit

Year	No. Trees	Volume Killed (M.B.M.)	Per cent of Stand Killed
1928	27,800	19,500	1.61%
1929	17,000	17,000	1.46%

Timber Mountain Unit

The loss on this unit continued to decline slightly during 1929. However, the site is a very poor one and the trees are suffering from drought as well as severe competition from reproduction. The losses here will probably continue to be higher than what is ordinarily considered to be a normal loss in western yellow pine, until the present mature stand has been very largely thinned.

The losses which have occurred since the fire in 1924 have run as follows:

Timber Mountain Unit

Year	Av. Per Cent of Stand Killed	Volume of Timber Killed (M.B.M.)
1925	5.32%	1,170
1926	8.64	1,900
1927	14.30	3,150
1928	2.05	450
1929	1.90	400

Badger Unit

Conditions on the Badger Unit were covered in a separate report made by the writer immediately after the survey of this unit had been completed. This was desirable in order that the Pickering Company might have the earliest possible information as to the necessity for control in the unit.

The area covered with control last year showed a 90% reduction in loss, and the adjoining untreated areas declined 78%

The loss for the unit as a whole is still above normal, however, with 1.40% of the stand killed during 1929. This infestation is grouped in portions of the unit near Flag Springs and around Deer Hill, and it is in the former area that control work for this fall was recommended (see attached map).

The progress of the infestation, both on and off the controlled area, has been as follows:

Area Controlled in Fall and Winter, 1928

<u>No. Trees Killed</u>	<u>Volume Killed</u>	<u>Per cent of Stand</u>		
18,210	15,000	7.20%	Before Control	1928
1,660	1,350	.65%	After "	1929

Balance of Badger Unit

<u>No. Trees Killed</u>	<u>Volume Killed</u>	<u>Per cent of Stand</u>		
57,290	45,400	7.40%	Before Control	1928
12,640	10,090	1.65	After "	1929

Lava Unit

Due to the wide spacing of trees in this unit and the good growth conditions which prevail, very little insect loss has been sustained. Even during the peak of the epidemic in 1927 so few trees were killed per unit area that they were hardly noticeable.

At present the infestation has practically resumed normal proportions. The losses for the last two years are as follows:

<u>Year</u>	<u>No. Trees Killed</u>	<u>Volume Timber Killed (MBM.)</u>	<u>Per cent Stand Killed</u>
1928	11,500	8,650	1.37%
1929	6,600	5,280	.84%

Happy Camp Unit

This unit comprises the bulk of the area known as the "Egg Lake Tract", lying between Egg Lake and Happy Camp Ranger Station. The "Happy Camp Unit" designation and boundaries are retained for the purpose of the report, as they include a definite area which has been reported upon for many years as to beetle losses, and for which the current yearly losses are comparable.

During 1926 and 1927 the losses on this unit were particularly heavy, with the infestation occurring in large groups but with very little scattered infestation in between. Over 4% of the stand was killed during those two years.

The decline started on this unit with the winter loss of 1927, just a year before the infestation broke on the Badger Unit, and continued to decrease through 1928 and 1929.

The attacks of this last year (1929) were well below 1% of the stand over the greater part of the unit. There is one belt through the north-central portion (as shown by the attached map) where the losses are still somewhat over 1%, but all of the unit appears to be on the decline, with no aggressive centers of new infestation.

For the past two years the losses on the unit have been as follows:

Year	No. Trees	Volume Killed (MBM)	Per cent of Stand
1928	22,500	20,100	1.54%
1929	9,400	8,930	.97%

Pit River Unit

The area which has been designated for the purpose of these reports as the "Pit River Unit" is now the southern half of the Badger Sale Area. It differs markedly from the northern portion of the Badger Sale Area in that the timber is very patchy, broken everywhere by large rock flats. Only on the slope of Happy Camp Mountain are there any extensive unbroken stands.

The peak of the recent epidemic was reached in the fall of 1927. During that year 3.28% of the stand was killed; but since the stand was very open and scattered this did not mean a very heavy loss in terms of board feet.

Since 1927 the infestation has gradually declined, but the drop has not been so marked as in other units, where the loss during the peak of the epidemic was more severe.

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For the past two¹ years the losses have been as follows:

Year	No. Trees Killed	Volume Killed (MBM)	Per cent of Stand Killed
1928	8,200	7,000	2.26%
1929	4,000	4,000	1.31

White Horse Unit

Last year the McCloud River Lumber Company actively moved their logging operations into this unit, and have started cutting on a large scale. Their first work was confined to a narrow belt along the main line of their railroad in Secs. 34, 35 and 36 of T 41 N, R 4 E, and Secs. 5 and 6 of T 40 N, R 5 E, where the losses for the past few years have been the heaviest.

In the fall of 1928 they started a large-scale control operation covering 121,950 acres of their holdings with control work, and spending \$10,914.29.

On sections close to their main-line railroad beetle-infested trees were felled and skidded to the railroad and sent to the mill. Farther back the trees were felled, peeled and burned. Altogether 626 trees were salvaged and 1,721 trees treated by the burning method. The entire operation was done at an average cost of \$4.65 per tree.

As the result of this control work and the natural reduction which took place during 1929, the White Horse Unit is now in very good shape, with the loss below what is considered normal for this area, and with the lowest loss of any unit of the Happy Camp District.

The operation was visited by the writer in October, and it was suggested that for the present season no attempt be made to reclean the entire area, but that only such infested trees as could be reached with salvage operations be brought in and the infested bark disposed of. This much work should serve to keep the infestation down on the more accessible portions of the unit, and then the work could be extended in the event that next year an epidemic again threatens to develop in the general region.

For the last two seasons the loss on this unit has been as follows:

Year	No. Trees	Volume Killed (MBM)	Per cent of Stand Killed
1928	14,900 ¹	17,900 ¹	1.34%
1929	5,200	6,240	.49% ²

¹ 2,347 trees and 2,960,610 bd.ft. treated in the McCloud River Lumber Company's control operation

² This percentage of annual loss without question replaced by growth, and no more than the normal death rate in a forest of this type

Conclusions and Recommendations

With the natural decline which has occurred throughout the area and the additional reductions brought about as the result of control work, the Happy Camp-Lava Bed Area is now at the lowest point in its pine beetle infestation cycle since 1924.

However, only a small part of the area has reached the point where the infestation can be called normal. The White Horse Unit now comes in this category, and the Lava and Happy Camp Units are not far above this point.

Portions of the Glass Mountain Unit are still highly epidemic, although only a relatively small portion is affected. As this portion has already been so beetle-ridden as to make it almost unmerchantable, it is doubtful if control or salvage operations are now justified, unless justified from other than beetle-control considerations. This unit should certainly be given high priority in the schedule for early cutting, as the timber is dying fast and rapidly deteriorating.

With the control work which is now being done on the Badger Unit, the only epidemic center (other than the Glass Mountain Unit) is being controlled and no other work need be considered at this time.

However, it will be well for the owners to be prepared for an increase in beetle activity in 1930. The past year of very poor tree growth and the long dry fall will undoubtedly have their effect in increasing the number of beetle-susceptible trees. With enough beetles on the area for "seed", it will not take long for them to reach epidemic proportions again.

With this danger in mind, developments during the summer of 1930 should be carefully watched; and if an increase develops, plans should be made at an early date to cope with the situation.

Another survey in the fall of 1930 is quite essential, to determine the trend of bark beetle activity and the need for further control work on the Badger Sale Area under the contract of sale made with the Pickering Lumber Company.

Respectfully submitted,

/s/ F. P. KEEN,

December 1, 1929

Entomologist.

Note: Since the writer has been transferred to Portland, Oregon, future surveys of the area will be handled under the supervision of Mr. J.M. Miller of the California Station of the Bureau of Entomology, located at 450 Jordan Hall, Stanford University, Calif.

HAPPY CAMP-LAVA BED AREA

ESTIMATED LOSS

FOR 1929

Unit	Acres	Volume of Stand (MBM)	Killed During 1929			
			Trees	Av. Volume per Tree	Volume M.B.M.	Per cent of Stand
Glass Mountain ¹	68,860	1,162,000	17,000	1,000	17,000	1.46%
Timber Mountain	2,600	21,000	500	800	400	1.90%
Badger	67,760	818,000	14,300	800	11,440	1.40%
Lava	73,200	629,000	6,600	800	5,280	.84%
Happy Camp	68,660	1,292,000	9,400	950	8,930	.69%
Pit River	35,200	306,000	4,000	1,000	4,000	1.31%
White Horse ²	60,800	1,278,000	5,200	1,200	6,240	.49%
Totals	377,080	5,506,000	57,000	940	53,290	.97%

¹ About 2500 acres cut over and 45 million bd.ft. removed by Long-Bell Lumber Co.

² " 2500 " " " 55 " " " McCloud River " "

HAPPY CAMP-LAVA BED AREA

VOLUME (MBM) OF 1929 LOSS BY OWNERSHIP

Unit	Nat. Forest	Pickering: Lumber Co.	McCloud River: Lumber Co.	Long-Bell: Lbr. Co.	Red River: Lbr. Co.	Others	Total
Glass Mt.	5,700	6,950	---	4,350	---	---	17,000
Timber Mt.	300	---	---	80	---	20	400
Badger	5,000	5,670	---	---	720	50	11,440
Lava	4,740	150	390	---	---	---	5,280
Happy Camp	1,200	7,510	---	---	---	220	8,930
Pit River	2,280	1,450	---	---	---	270	4,000
White Horse	600	---	5,500	---	---	140	6,240
Total	19,820	21,730	5,890	4,430	720	700	53,290

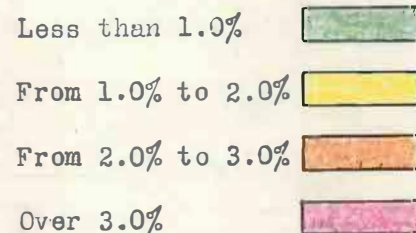
HAPPY CAMP --LAVA BED AREA
MODOC NATIONAL FOREST, CALIFORNIA.

ESTIMATED LOSS FROM PINE BEETLES 1929.

Legend

Unit Boundaries

Percent of Stand Killed in 1929



December 1, 1929.

